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## United States Patent Application

For

### METHODS OF MAKING AND USING DRY LAMINATED BUSINESS CARD SHEET CONSTRUCTIONS

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Forming Printable Media Using a Laminate  
METHODS OF MAKING AND USING DRY LAMINATED BUSINESS CARD  
1 SHEET CONSTRUCTIONS Sheet Construction

**Background of the Invention**

The present invention relates to printing sheet constructions which are adapted to be fed into printers or copiers and indicia printed on different portions thereof and the portions thereafter separated into separate printed media, such as business cards. It further is concerned with methods for making those printing sheet constructions and also the separate printed media.

Small size media, such as business cards, ROLODEX-type card file cards, party invitations and visitors cards, because of their small format, cannot be fed into and easily printed using today's ink jet printers, laser printers, photocopiers and other ordinary printing and typing machines. Therefore, one known method of producing small size media has been to print the desired indicia on different portions of a large sheet such as 8 1/2 by 11 or 8 1/2 by 14 or A4 size sheets, and then to cut the sheets with some type of cutting machine into the different portions or individual small size sheets or media with the printing on each of them. However, this method is disadvantageous because the user must have access to such a cutting machine, and the separate cutting step is cost and time inefficient.

To avoid this cutting step, another prior art product has the portions of the sheet which define the perimeters of the media (e.g., the business cards) formed by preformed perforation lines. (See, e.g., PCT International Publication No. WO-97/40979.) However, a problem with this product was that since these cards must be durable and professional looking, they had to be made from relatively thick and heavy paper. And the thick, heavy perforated sheets are relatively inflexible, such that they cannot be fed from a stack of such sheets using automatic paper feeders into the printers and copiers. One proposed solution to this feeding problem is disclosed in U.S. Patent 4,704,317 ('317) to Hickenbotham. (This patent and all other patents and other publications mentioned anywhere in this disclosure are hereby incorporated by reference in their entireties.) The method of the '317 patent reduces the

stiffness of the corners of the sheet as by scoring, slitting, die cutting or calendering. However, a number of problems with this method prevented it from becoming generally commercially acceptable.

Another attempted solution to the sheet feeding problem is that disclosed in U.S. Patent 5,571,587 ('587) to Bishop et al. (See also U.S. Patent 4,447,481 to Holmberg et al.) Pursuant to the '587 patent the sheetstock has a relatively thin portion on at least one of the longitudinal edges thereof which facilitates feeding the sheetstock into a printer or copier. The thin portion is removed from the sheet after printing. The individual printed cards are then separated from one another by pulling or tearing along the preformed microperforated lines. While the perforation ties remaining along the edges of the printed cards thereby formed are small, they are perceptible, giving the card a less than professional appearance and feel.

A card sheet construction which uses clean cut edges instead of the less desirable perforated edges is commercially available from Max Seidel and from Promaxx/"Paper Direct", and an example of this product is shown in the drawings by FIGS. 1-3. (See Canadian Patent Publication No. 2,148,553 (MTL Modern Technologies Lizenz GmbH); see also German DE.42.40.825.A1.) Referring to these drawing figures, the prior art product is shown generally at 100. It includes a sheetstock 102, divided by widthwise and lengthwise cut lines 104 in columns and rows of cards 110, surrounded by a perimeter frame 112. On the back side 114 of the sheetstock 102, thin carrier element strips 116 made of polyester are glued with adhesive 118 along and over the widthwise cut lines. These strips 116 hold the cards 110 and the frame 112 together when the sheetstock 102 is fed into a printer or copier as shown generally at 120. After the sheetstock 100 has been fed into the printer or copier 120 and the desired indicia printed on the cards 110, the cards are peeled off of and away from the strips 116 and frame 112. After all of the cards 110 have been so removed from the sheetstock 102, the left-over material formed by the strips 116 and the frame 112 is discarded as waste material.

One of the problems with the prior art sheet product 100 is that printers have difficulty picking the sheets up, resulting in the sheets being misfed into the printers. In other words, it is difficult for the infeed rollers to pull the sheets past the separation tabs within the printers. Feeding difficulties are also caused by curl of the sheetstock 102 back onto itself. The "curl"

Another problem with the prior art sheet 100 is a start-of-sheet, off-registration problem. In other words, the print is shifted up or down from its expected desired starting position below the top of the sheet. This off-registration problem is often related to the misfeeding problem discussed in the paragraph above. This is because if the printer is having difficulty picking up the sheet, the timing of the printer is effected. And this causes the print to begin at different places on the sheet, which is unacceptable to the users.

Directed to remedying the problems in and overcoming the disadvantages of the prior art, disclosed herein is a dry laminated sheet construction including printable media, such as business cards, ROLODEX type cards, party invitations, visitor cards or the like. A first step in the formation of this dry laminated sheet construction is to extrusion coat a low density polyethylene (LPDE) layer on a densified bleached kraft paper liner, thereby forming a film-coated liner sheet. Using a layer of hot melt adhesive, a facestock sheet is adhered to the film side of the liner sheet to form a laminated sheet construction web. A more generic description of the "dry peel" materials -- the LPDE, and densified bleached kraft paper liner -- is a film forming polymer coated onto a liner stock. The facestock sheet, the film layer and the adhesive layer together define a laminate facestock. (See U.S. Patent 4,863,772 (Cross); see also U.S. Patents 3,420,364 (Kennedy), 3,769,147 (Kamendat et al), 4,004,058 (Buros et al), 4,020,204 (Taylor et al), and 4,405,401 (Stahl)). The sheet construction (which also includes a facestock bonded to the film-forming polymer) separates at the film-liner interface rather than the facestock-film interface, when the final construction is subjected to a peeling force.

According to one embodiment of this invention, a web of laminate facestock is calendered along one or both edges thereof to assist in subsequent printer feed of the printable media sheets. The calendered edges help prevent the multiple sheet feed-through, misfeed and registration problems of the prior art. Lines are die cut through the laminate facestock and to but not through the liner sheet. These facestock cut lines define the perimeters of

blank business cards (or other printable media) and a surrounding waste paper frame. These die cut lines do not cause sheets to get caught in one another. This allows sheets to be effectively fed into printers. Lines are then cut through the liner sheet, but not through the laminate facestock, to form liner sheet strips on the back face of the laminate facestock. The liner sheet cut lines can each be straight lines or they can be curving, wavy lines. The lines can be horizontally (or vertically) straight across the sheet or diagonally positioned thereon. According to one alternative, the lines can extend only part way across the sheet, such as from both side edges, to only a central zone of the sheet. Further steps in the process are to sheet the web into individual sheets, stack and package them and distribute the packaged sheets through retail channels to end users.

The laminated (business card) sheets are unpackaged by the user and stacked into the feed tray of a printer or copier and individually and automatically fed, calendered edge first into a printer (and particularly a horizontal feed ink jet printer) or copier where indicia is printed on each of the printable media (or blank business cards) on the sheet. After the printing operation, each of the printed media (or business cards) is peeled off of the liner sheet strips and out from the waste paper frame. The support structure formed by the strips and the frame is subsequently discarded. Alternatively, the support structure is peeled off of the printed business cards. The product, in either event, is a stack of cleanly printed business cards, each having clean die cut edges about its entire perimeter.

In other words, the adhesive layer securely bonds the facestock sheet to the LPDE film layer on the liner sheet. It bonds it such that the overall sheet construction separates or delaminates at the film-liner sheet interface, when the user peels the printed business cards and liner strips apart. That is, it does not separate at the facestock sheet interface. Additionally, the film-coated liner sheet does not significantly affect the flexibility of the sheet as it is fed through the printer. Rather, it is the thickness of the facestock which is the more significant factor. Thus, the facestock sheet needs to be carefully selected so as to not be so stiff that feeding or printing registration problems result.

Pursuant to some of the preferred embodiments of the invention, every other one of the strips is peeled off and removed from the sheet during the manufacturing process and before the sheet is fed into a printer or copier. The remaining strips cover a substantial number of the laminated facestock cut lines and extend onto the waste paper frame to hold the

business card blanks and the sheet together as they are fed into and passed through the printer or copier. The remaining strips (and thus the facestock cut lines) preferably extend width-wise on the sheet or are perpendicular to the feed direction of the sheet to make the laminated sheet construction less stiff and more flexible as it passes into and through the printer or copier. By starting off with a single continuous liner sheet to form the strips, the final stripped product is flatter than the prior art products. Thus, it is less likely that the sheets will bow and snag together.

Other embodiments do not remove any of the strips before the sheet is fed into the printer or copier. In other words, the entire back side of the laminated facestock is covered by the liner sheet having a series of liner-sheet cut lines.

A further definition of the method of making this invention includes forming a roll of a web of dry laminate sheet construction comprising a liner sheet on a facestock sheet. The web is unwound under constant tension from the web and the edges of the web are calendered. The facestock sheet of the unwound web is die cut without cutting the liner sheet to form perimeter outlines of the printable media (business cards). The liner sheet is then die cut, without cutting the facestock sheet, to form liner strips. Alternating ones of the interconnected liner strips are removed as a waste liner matrix and rolled onto a roll and disposed of. The web is then sheeted into eleven by eight-and-a-half inch sheets, for example, or eight-and-a-half by fourteen or in A4 dimensions; the sheets are stacked, and the stacked sheets are packaged. The user subsequently removes the stack of sheets from the packaging and positions the stack or a portion thereof in an infeed tray of a printer or copier for a printing operation on the printable media or individually feeds them into the printer or copier. After the printing operation, the printed media are separated from the rest of the sheet, as previously described.

Sheet constructions of this invention appear to work on the following ink jet printers: HP550C, HP660C, HP722C, HP870Cse, Canon BJC620, Canon BJC4100, Epson Stylus Color II and Epson Stylus Color 600.

Another advantage of the embodiments of the present invention wherein alternate strips of the liner are removed before the printing operation is that a memory curl is less likely to be imparted or induced in the business cards from the liner sheet. Memory curl occurs when the facestock is removed from a full liner sheet. The liner strips are better than

Other objects and advantages of the present invention will become more apparent to those persons having ordinary skill in the art to which the present invention pertains from the foregoing description taken in conjunction with the accompanying drawings.

FIG. 3 is an enlarged cross-sectional view taken on line 3-3 of FIG. 2;

FIG. 4 is a perspective view showing a laminated sheet construction of the present invention being fed into a printer or copier and a laminated sheet construction of the present invention after a printing operation has been performed thereon by the printer or copier;

FIG. 5 is a view similar to that of FIG. 2 but of a first laminated sheet construction of the present invention, such as is shown in FIG. 4;

FIG. 6 is an enlarged cross-sectional view taken on line 6-6 of FIG. 5;

FIG. 7 is a plan view of the back of the first laminated sheet construction of FIG. 5;

FIG. 8 is a plan view of the front of the first laminated sheet construction of FIG. 7;

FIG. 9 is an enlarged cross-sectional view taken on line 9-9 of FIG. 1;

FIG. 9A is a view similar to FIG. 9 illustrating a portion of a first alternative construction;

FIG. 9B illustrates a portion of a second alternative construction;

FIG. 10 is a view similar to FIG. 7;

FIG. 11 is a view similar to FIG. 8;

FIG. 12 is a perspective view showing a stack of laminated sheet constructions of the present invention operatively positioned in an automatic feed tray of a printer or copier waiting to be individually fed therein for a printing operation and a sheet from the stack having already been printed;

FIG. 13 is a view similar to FIG. 7 but of a second laminated sheet construction of the present invention;

FIG. 14 is a view similar to FIG. 13;

FIG. 15 is a back view of a third laminated sheet construction of the present invention;

FIG. 16 is a view similar to FIG. 15;

FIG. 17 is a back view of a fourth laminated sheet construction of the present invention;

FIG. 18 is a view similar to FIG. 17 and of the fourth laminated sheet construction;

FIG. 19 is a back view of a fifth laminated sheet construction of the present invention;

FIG. 19A is a back view of sixth laminated sheet construction of the present invention;

FIG. 20 is a back view of a seventh laminated sheet construction of the present invention;



FIG. 21 is a back view of an eighth laminated sheet construction of the present invention;

FIG. 22 shows the dimensions of the strips of FIG. 21;

FIG. 23 is an enlarged cross-sectional view taken on line 23-23 of FIG. 21;

FIG. 24 is a view similar to FIG. 23 but showing a ninth laminated sheet construction of the present invention;

FIG. 25 is a schematic view showing a process and system of making the sheet constructions of FIGS. 21 and 26;

FIG. 26 is a view similar to FIG. 23 but showing a tenth laminated sheet construction of the present invention;

FIG. 27 is a front view of an eleventh laminated sheet construction of the present invention; and

FIG. 28 is an enlarged cross-sectional view taken on line 28-28 of FIG. 27.

#### **Detailed Description of Preferred Embodiments of the Invention**

A number of different embodiments and manufacturing processes of the dry laminated business card sheet constructions of this invention are illustrated in the drawings and described in detail herein. A representative or first sheet construction is illustrated generally at 200 in FIGS. 5, 6 and 7, for example.

Referring to FIG. 4, sheet construction 200 is formed by extrusion coating a low density polyethylene (LDPE) layer 204 onto a densified bleached kraft paper liner sheet (or base paper or base material) 208, which is not siliconized. The thin extrusion-cast LDPE layer 204 is unoriented. A suitable liner sheet 208 with layer 204 is available from Schoeller Technical Papers of Pulaski, New York. The extrusion-coated liner sheet is laminated to a facestock sheet (or card stock) 212 using a layer of hot melt pressure sensitive adhesive (PSA) 216. The facestock sheet 212, the adhesive layer 216 and the film 204 form a laminate facestock 220. The facestock sheet 212 can be current ink jet business card stock available from the Monadnock paper mills and which has good printability and whiteness. The adhesive of layer 216 can be a conventional hot melt adhesive such as H2187-01 hot melt adhesive available from Ato Findlay, Inc. of Wauwatosa, Wisconsin, or hot melt rubber-resin adhesive compositions of the type taught in U.S. Patent 3,239,478 (Harlan, Jr.). The

requirements for the hot melt PSA are not very demanding. The PSA layer 216 need only secure the facestock sheet 212 to the LDPE layer 204 of the dry release base material or liner sheet 208, such that the overall dry laminate facestock construction 224 delaminates at the LDPE-liner sheet interface when a user seeks to peel away the liner, and not at a surface of the facestock sheet 212.

A preferred example of this dry laminate facestock construction 224 is the "Dry Tag" product such as manufactured at the Fasson Roll Division of Avery Dennison Corporation. The facestock sheet 212 can alternatively be fluorescent paper, high gloss paper or thermal transfer label paper. A preferred high photo glossy paper which can be used is the glossy cardstock which is available from Rexam Graphics of Portland, Oregon and has a thickness of approximately eight mil.

Preferred thicknesses of each of the layers of the laminate facestock construction 224 are as follows: the liner sheet 208 -- 3.0 mil; the LDPE film layer 204 -- .80 to 1.0 mil; the adhesive layer 216 -- .60 to .75 mil; and the facestock sheet 212 -- 8.3 or 8.5 to 9.0 mil. Alternatively, the liner sheet 208 plus the film layer 204 can have a 3.5 mil thickness. Another alternative is for the thicknesses of the facestock sheet 212 and the liner sheet 208 to be approximately 6.0 and 3.0 mil, respectively, or approximately 7.0 and 2.0 mil, respectively. The LDPE layer 204 will not significantly affect the flexibility of the sheet construction; rather, it is the thickness of the facestock 212 which is the more significant factor. To assist the picking up and feeding of the laminate facestock construction 224 into the printer or copier 230, the leading edge 234 can be, according to one definition of this invention, calendered or crushed, as shown in FIG. 6. More particularly, a 7/16 inch wide portion of the leading edge 234 can be crushed with a calendering die to reduce the caliper from thirteen mil to ten mil, for example.

In addition to calendering the leading edge 234 of the laminate facestock construction 224, further processing steps are needed to form the sheet construction 200. One key step is to form cut lines 240 on and through the laminate facestock. Referring to FIGS. 8 and 11, the cut lines 240 include frame cut lines 244 and grid cut lines 248, and the frame cut lines include side cut lines 252 and end cut lines 256. The frame cut lines 244 define a border or frame 260 around the central area 264 of the sheet. And the grid cut lines 240 form a grid of spaced horizontal and vertical cut lines 270, 274 in the central area 264. Thereby, the grid cut

lines 248 and the frame cut lines 244 form the perimeters of rectangular media 280, such as business cards. FIG. 8 shows that a preferred number of the rectangular media 280 is ten, aligned in two columns of five each and surrounded by the frame 260. FIG. 11 shows that preferred dimensions 284, 288, 292, 296 and 298 are  $1/2$ ,  $3\ 1/2$ ,  $11/32$ ,  $3/8$  and 2 inches, respectively.

The facestock cut lines 240 extend through the laminate facestock construction 224 and to but not through the liner sheet 208. If the facestock cut lines 240 passed through the liner sheet 208, the laminate facestock construction 224 would fall apart into the rectangular media 280 and the frame 260, each separate from the other. The separate small media cannot be passed effectively through the printer or copier 230 for a printing operation on them. Instead, the facestock cut lines 240 do not pass through the liner sheet 208. However, the continuous liner sheet 208, while it would hold the (ten) rectangular media 280 and the frame 260 together during the printing operation, may make the sheet construction 200 too rigid, lacking the flexibility to pass through the curving feed paths in printers or copiers. In some of the figures which show the back or liner face of the sheet construction, the facestock cut lines 240 are shown in dotted lines to depict their relationship with the liner sheet strips as discussed below. Although the facestock cut lines 240 and the liner-sheet cut lines discussed below are preferably formed by die cutting, other techniques such as laser cutting or using a circular cutting blade as would be known by those skilled in the art are within the scope of this invention.

Therefore, pursuant to the present invention, liner-sheet cut lines 300 are formed on the liner sheet 208, through the liner sheet and to but not through the laminate facestock 224. They divide the liner sheet 208 into liner strips 304. The liner-sheet cut lines 300 provide flexibility to the sheet construction 200 and according to some of the embodiments of this invention, adequate flexibility. However, for others the flexibility is not enough, so these embodiments provide that some of the strips are removed from the laminate facestock 224 to form the sheet construction which is passed through the printer or copier 230. More importantly, by removing some of the liner strips, the amount of memory curl induced in the (printed) media is reduced. The remaining strips 308, however, must be sufficient to hold the cut laminate facestock 224 together during the printing operation. In other words, the shape and location of the remaining strips 308 are selected on the one hand to provide sufficient

sheet flexibility and to minimize memory curl and on the other hand to provide sufficient sheet integrity. In particular, according to preferred embodiments, the remaining strips cover all of the facestock cut lines 240 which are parallel to the infeed edge of the sheet. Where the sheet is to be fed in the portrait direction into the printer or copier 230, the covered facestock cut lines extend width-wise on the sheets.

The embodiment of FIG. 7 shows the remaining strips 308, 340 being relatively thin, but still covering and overlapping the horizontal facestock cut lines. FIG. 10 gives the dimensions of the sheet construction 200 and the remaining strips 308. Dimensions 312, 316, 320, 324 and 328 are 7/8, 3/4, 1 1/4, 8 1/2 and 11.00 inches, respectively. In contrast, the remaining strips 340 in the sheet construction as shown generally at 350 in FIG. 13 are wider. The dimensions of the strips and sheet are shown in FIG. 14 by dimensions 354, 358, 362, 366 and 370, as being 1 1/4, 1/2, 1 1/2, 8 1/2 and 11.00 inches, respectively.

FIGS. 9A and 9B are enlarged cross-sectional views of first and second alternative sheet constructions of this invention. They are alternatives to the LDPE/densified bleached kraft paper component of FIG. 9, for example. The relative thicknesses of the layers are not represented in these drawings. Alternative construction shown generally at 372 in FIG. 9A uses vinyl or another cast film on its casting sheet. Referring to FIG. 9A, the tag facestock or other paper sheet is shown by reference numeral 374a. The PSA layer, vinyl or cast film, and the casting sheet are labeled with reference numerals, 374b, 374c and 374d, respectively. Reference numerals 375a and 375b depict the facestock cut lines and liner cut lines. Similarly, the second alternative shown generally at 376 in FIG. 9B includes tag facestock or other face paper 377a, PSA layer 377b, film #1 377c, film #2 377d and liner 377e. The facestock and die cut lines are shown by reference numerals 378a and 378b, respectively.

While sheet constructions 200, 350 show the liner-sheet cut lines and thus strips 308, 340 extending straight across the sheet, sheet construction 380 has its liner-sheet cut lines 384 extending diagonally across the back of the laminate facestock. This construction is shown in FIG. 15, and FIG. 16 shows dimensions 390, 392, 394 and 398, which can be 1, 2, 1/2, and 1 1/2 inches, respectively. Sheet construction 380 includes all of the diagonal liner strips 388 still positioned on the laminate facestock during a printing operation. However, it is also within the scope of the invention to remove (unpeel) one or more of the strips before the printing operation. One arrangement would remove alternating ones of the diagonal strips.

However, it may be that the remaining (diagonal) strips do not provide the sheet with sufficient integrity to prevent bowing of the sheet on the facestock cut lines.

The liner-sheet cut lines 300, 384 are discussed above and as shown in the corresponding drawing figures are all straight lines. However, it is also within the scope of the invention to make them curving or wavy, and a sheet construction embodiment having wavy or curving lines 412 is illustrated generally at 416 in FIG. 17. It is seen therein that the liner-sheet cut lines 412 on opposite sides of the strips 420 thereby formed have opposite or mirror images. Referring to FIG. 18, preferred dimensions 424, 428, 432, 436, 440 and 442 are 27/32, 1, 1 11/32, 3 1/2, 3/4 and 8 1/2 inches, respectively. The sheet construction embodiment 416 is fed into the printer or copier 230 in the condition as illustrated in FIG. 17, that is, none of the liner strips has been removed. A variation thereon is illustrated by the sheet construction shown generally at 450 in FIG. 19 wherein alternating ones of the strips (five eye-goggle shaped strips) have been removed exposing the back surface of the facestock laminate as shown at 454.

It is also within the scope of the present invention for the liner-sheet cut lines and thus the liner strips to not extend from one side or edge of the sheet to the other. A sheet construction embodying such a configuration is shown in FIG. 19A generally at 455. Essentially the only difference between sheet construction 455 in FIG. 19A and sheet construction 450 in FIG. 19 is that the wavy liner-sheet cut lines 456 do not extend from one side of the sheet to the other. Rather, they stop near the center of the liner sheet and short connector lines 457a, 457b form pairs of oppositely-facing fish-shaped strips, which when removed expose pairs of oppositely-facing fish-shaped portions 458a, 458b of the laminate facestock. (For straight liner cut lines, instead of wavy cut lines, the exposed shapes would be rectangles instead of fish shapes.) Strips 459 of the liner sheet remain between the adjacent pairs of connector lines 457a, 457b. The strips 459 cover portions of the central vertical facestock cut lines and thereby help to maintain the integrity of the sheet construction.

Flexibility of the sheet constructions at both ends thereof is important. Accordingly, referring to FIG. 20, flexibility cut lines 460 are formed in the end liner strips 462 extending the full width of the strips in the sheet construction embodiment shown generally at 464 and which is similar to the wide strip embodiment of FIG. 13. The dotted lines in that figure

show the locations of the facestock cut lines 240 in the laminate facestock 220 and are included in the figure to illustrate the relative positioning of the liner-sheet cut lines 300 (and the strips thereby formed) and the facestock cut lines 240. As can be seen the flexibility cut lines 460 are positioned between the ends of the sheet construction and the adjacent end frame cut lines 256. This provides flexibility to the end portions of the waste frame 260. The flexibility cut lines 460 are preferably formed in the same operation (die cutting) as the liner-sheet cut lines 300. So another way to view the flexibility cut lines 460 is that they are simply liner-sheet cut lines at the ends of the liner sheet 208 where the adjacent strips thereby formed are not removed. The thin liner strips are removed from locations 474 in the illustrated embodiment. And the remaining wide strips 478 are positioned over, covering and overlapping each of the facestock horizontal grid cut lines.

A preferred embodiment of the liner sheet or the liner-sheet cut lines 300 and liner strips is illustrated by sheet construction shown generally at 482 in FIG. 21. Referring thereto, it is seen that the liner-sheet cut lines form three different types of strips, namely, (two) end wide strips 486, (four) central wide strips 490 and (ten) thin strips 494. The end wide strips 486 are provided at both ends of the sheet and extend the full width of the sheet and along the entire edge thereof. Flexibility cut lines 496 are provided in each of the end wide strips 486, positioned similar to those in the FIG. 19 embodiment. The central wide strips 490 cover each of the horizontal facestock grid cut lines. They are not quite as wide as the corresponding strips in FIG. 19. Thus, more of the frame vertical facestock cut lines are exposed on the liner side of the sheet. This can result in them bowing out and snagging as the sheet winds its way through the printer or copier 230.

Accordingly, the sheet construction 482 of FIG. 21 provides for thin strips 494 positioned between and parallel to the wide strips 486, 490. These thin strips 494 cross over each of the vertical facestock cut lines and thereby prevent the potential bowing out problem. Two of the thin strips are provided between each of the neighboring wide strips. Of course, it is within the scope of the invention to provide for only one thin strip between the neighboring wide strips or to provide for more than two thin strips, or to make them the same width as the wide strips or to eliminate them altogether. The central wide strips 490 and the thin strips 494 all have rounded corners 500, 504.

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Each of the thin strips 494 and each of the central wide strips 490 extend a distance past the vertical frame cut lines, but not to the edge of the sheet. In other words, a liner edge or margin is left on both sides extending between the end wide strips 486. What this means is that the liner sheet "strips" which are removed after the liner-sheet cut lines are made and before the sheet construction is sent to the user for a printing operation are interconnected into a web or matrix. That is, all of the liner portions (or strips) between the thin strips 494 and the adjacent wide strips 486, 490 and between the adjacent thin strips are connected to the borders or margins and thereby to each other in a continuous web or matrix. Thus, by grabbing any portion of this matrix, and preferably a corner thereof, the entire matrix can be pulled off of the laminate facestock in essentially one step. As will be described with reference to FIG. 25, each of the matrices of the sheet construction web is wound onto a roll and the roll subsequently discarded. This is easier, faster, quicker and cheaper than pulling a number of individual liner waste strips off of the laminate facestock as is done when the strips are not interconnected. The dimensions of the strips and their spacings as shown by dimensions 512, 516, 520, 524, 528 and 532 in FIG. 22 are 8 1/2, 8, 1/4, 1/4, 3/4 and 1/8 inches, respectively.

Both end edges are crushed or calendered as can be seen in FIG. 23 at 536, preferably on the facestock side, but in the waste frame portion and not extending into the central area on the printable media. Alternatively and referring to the sheet construction as shown generally at 538 in FIG. 24, both sides can be crushed or calendered or only the liner sheet side as shown at 540.

A schematic view of the system and process for manufacturing the laminate sheet construction 482 of FIG. 21 is illustrated in FIG. 25 generally at 550. Each of the successive steps or stations is illustrated from left to right in that drawing figure. As shown, a web 554 of the dry laminate facestock formed as described previously and rolled on a roll 558 is delivered from the Avery Dennison Fasson Division, for example, to the press facility, such as a Webtron (Canada) Model 1618 press. At the press facility, the roll 558 is unwound with the facestock side up and the liner side down and is delivered to the printing station shown generally at 562, and which includes a print cylinder 566, an anilox roll 570 and an ink supply 574. At the printing station 562, desired identifying and informational indicia are printed on the facestock of the laminate such as on the frame portion. This indicia can

include product code identification, the manufacturer's or distributor's name and logo, and patent numbers, if any.

The web 554 is then pulled to the turning station shown generally at 580 where a turn bar 584 turns the web over so that the liner side is facing up and the facestock side is facing down for delivery to the calendering station. At the calendering station shown generally at 588 and including an anvil 592 and a calendering die 596, both edges of the web on the facestock side thereof are crushed for about 7/16 inch from a 13.4 mil thickness to approximately 10.4 mil.

The web 554 is pulled further to the two die cutting stations. The face cutting station shown generally at 600 includes an anvil 604 and a face cutting die 608, with the anvil positioned on top. At this station the face of the web 554 is cut up to the liner but without cutting the liner to create the business card shapes on the face with cut lines, as previously described. At the liner cutting station as shown generally at 620, the anvil 624 is positioned below the liner cut die 628, in a relative arrangement opposite to that at the face cutting station 600. The liner at this station 620 is die cut up to the face without cutting the face. At these die cutting stations 600, 620 a bridge bears down on the die bearers, which forces the die blades to cut into a predetermined portion of the caliper or thickness of the web. This portion is called a step, and is the difference between the bearer and the end of the die cutting blades. The smaller the step, the deeper the cut into the web, as would be understood by those skilled in the die cutting art.

The liner cutting forms the waste matrix 640 of the liner sheet. This matrix 640 is grabbed and pulled off of the web 554 and wound onto a roll 644 at the waste matrix station, which is shown generally at 648. The finished web 652 is thereby formed and delivered to the sheeting station. The calendering station 588, the face cutting station 600, the liner cutting station 620 and the waste matrix station 648 can essentially be arranged in any order except that the waste matrix station must follow the liner cutting station.

The sheeting station which is shown generally at 660 includes an anvil 664 and a sheeter cylinder 668. The eleven-inch wide web 652 is sheeted into eight-and-a-half inch sheets 672. Of course, if different sizes of sheets 672 (or 482) are desired (such as 8 1/2 by 14 inch or A4 size) then the width of the web and/or the sheeting distance can be altered or selected as needed. The final sheet constructions 672 (or 482) are shown stacked in a stack



680 at the stacking station, which is illustrated generally at 684. Each stack 680 of sheets can then be packaged and distributed to the end user through normal retail distribution channels.

The end user then unpackages the sheets and stacks them in a stack 686 in the infeed tray 694 of a printer (particularly an ink jet printer) or copier 230, such as shown in FIG. 12. (FIG. 12 shows sheet construction 200 and not 482.) The sheet construction 482 has tested well in ten sheet stack (684) automatic feeding tests in the following printers: HP DH 550/660C, Canon BJC 4100, Canon BJC 620, Epson Stylus Color 600 and Epson Stylus Color II. The printer or copier 230 preferably should not have temperatures above the melting point of the LDPE used in the sheet construction. During the printing operation by these printers 230, the desired indicia 690 is printed on each of the printable media or cards. This indicia 690 can include the user's (or card owner's) name, title, company, address, phone number, facsimile number, and/or e-mail address, as desired. The printed sheet constructions are shown in the outfeed tray 694 of the printer 230 in FIGS. 4 and 12. FIG. 4 shows an individual manual feed of the sheet constructions.

The individual printed media or business cards 700 are then peeled off of the rest of the sheet construction in an operation as shown in FIG. 5, for example. The remaining laminate facestock frame and liner strip product is disposed of. The result is a stack of neatly and accurately printed business cards 700. Each of the cards 700 has clean die cut edges defining its entire perimeter. The cards 700 were efficiently and quickly printed by the process(es) of this invention, since the sheet constructions can be stacked in the infeed tray and automatically fed into and through the printer 230, unlike the prior art.

A further preferred embodiment of the present invention is shown generally at 710 in FIG. 26. Sheet construction 710 is similar to sheet construction 482 except at one end of the sheet -- the top end as shown in FIG. 26. Referring thereto, the laminate facestock 220 (and/or the liner sheet 208) is not calendered to make the end edge of sheet construction 710 thinner and thereby easier to efficiently feed into the printer or copier. Instead a one-half inch strip of the laminate facestock 220 is stripped off of the liner sheet leaving only a thin infeed liner strip 714 at that end of the sheet construction. The infeed liner strip 714 is well suited for vertical feed printers because it allows the sheet to easily curve under the infeed roller(s). And the opposite calendered end is well suited for feeding into horizontal feed printers because of the straight path the sheet(s) take(s) to engage the infeed roller(s). Indicia can be

printed on the (front) frame of the laminate facestock 224 instructing the user as to which end of the sheet construction 710 defines the infeed end for vertical feed printers and for horizontal feed printers. A preferred embodiment of sheet construction 710 removes the end liner strip 716 defined by line 496.

Two alternative systems or method for stripping the laminate facestock strip are illustrated in FIG. 25. For both embodiments only one edge is crushed at the calendering station 588. According to one, the laminate facestock is die cut by die 720 (and anvil 722) along die cut line 724 (FIGS. 26-28) at the stripping station shown generally at 728 and the strip removed from the web as shown by arrow 732. (Alternatively, the facestock can be on top of the web for this step.) The die cut line 724 can be the same as the top frame cut line so that there is no "frame" along the top. The stripped web is then wound back onto a roll (558) and placed into position on the facility 588 as denoted by arrow 736. The stripped roll is placed back on the press prior to station 562, in the same place as 558, as shown in FIG. 25.

The other method or system does not use the separate stripping station 728. Instead the stripping is conducted in the facility 550. The die cut line 724 is made at the face cutting station 600. The facestock strip is then removed at the removal station shown generally at 740, which can be part of waste matrix station 648. At removal station 740, the face strip 744 is wrapped around a driven roll 748 and exhausted using an air line 752 into a vacuum system.

The arrangement of having one end of a sheet construction formed by stripping a strip (744) of a face sheet (such as laminate facestock) off of a backing sheet (such as a liner sheet) can be used not only on sheet construction 710 and the other previously-described sheet constructions but also on generally any multi-sheet construction.

An example thereof is the sheet construction shown generally at 780 in FIGS. 27 and 28. Referring thereto, the laminate facestock construction is the same as that of FIG. 26, for example. It similarly has the face cut lines 240, the strip cut line 724, and the calendered end 536. However, the liner 212 is a solid sheet with no cut lines or strips formed or removed. Instead of a dry laminate construction, it can be simply a face sheet adhered directly to a backing sheet with adhesive. And the facesheet separation lines (240) instead of being die cut can be microperfed. It still has the advantage of an efficient feed into a vertical feed printer

using one end of the construction as the infeed end and using the other for efficient feed into a horizontal feed printer.

From the foregoing detailed description, it will be evident that there are a number of changes, adaptations and modifications of the present invention which come within the province of those skilled in the art. For example, the printed media instead of being business cards can be post cards, mini-folded cards, tent cards or photo frames. However, it is intended that all such variations not departing from the spirit of the invention be considered as within the scope thereof.